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ABSTRACT

There has been a long-term rise in the relative share of the total number of workers engaged in producing intangible goods or services. Since 1967, this shift to employment in the service sector has been accommodated by a relative decline in manufacturing. Other trends that have taken place over the last decades and are likely to continue are increases in the number of women in the work force, the number of smaller-sized families, and the economic dependence of the elderly. Productivity increases and technological advances in the manufacture and distribution of goods will continue to reduce labor force requirements. Jobs will, however, increase in the following areas: business services that are purchased by goods- and service-producing enterprises; point-of-consumption work, such as retailing and restaurants; and services geared toward caring for people, providing protection and security, and maintaining the quality of a crowded environment. Private investments by parents and by individuals on their own behalf comprise much of the nation's total human resource development activity. Government policy in the area of human resource development and intervention in labor market operations will also have a powerful effect on the labor market of the future. The growing trend toward the use of contingent employees is another area of concern. While contingent employees provide employers with a great deal of flexibility, the practice can result in greater unemployment, for blue- and white-collar workers alike, in times of recession. (MN)

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Research Bulletin

No. 194

The Conference Board
70th Anniversary

Perspectives on Employment

by Audrey Freedman

Management Summary

Given at an International Seminar on Employment in Paris, this paper focuses on the probable trends in employment growth to the end of the century.

Productivity increases in the manufacture and distribution of goods will continue to reduce labor requirements.

Employment will continue to shift toward "intangible" production of services. Jobs will increase in

- business services that are purchased by goods-producing and service-producing enterprises.
- point-of-consumption work, such as retailing and restaurants.
- caring for people; protection and security functions; maintaining the quality of a crowded environment

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Introduction

In the summer of 1985, an executive of the French company L'Oreal, M. Jean Bounine-Caballe, came to The Conference Board to discuss future trends in productivity and employment. From these conversations there developed a view that advanced industrial societies are travelling along similar paths, particularly in their labor market and employment futures, toward the next century.

M. Francois Dalle, former Chief Executive of L'Oreal and President de la Commission Nationale de l'Industrie, convened an International Seminar on Employment in Paris, October 23, 1985, to develop these points with particular regard to the French, Japanese, and American economies. The study below, which was given at that Liaisons Sociales meeting, will be published in France this year in a somewhat longer version, with more comparative French data. M. Dalle has permitted the author to publish the English version as a Conference Board Research Bulletin.

Employment Patterns and Shifts

Far from being calm and smooth, the United States labor market has been undergoing a series of "revolutions" that seem to be occurring at a faster and faster pace. Social changes, economic development in other parts of the world, government policy, and technological advances all have complex effects in the employment market—in how the U.S. population produces, and how it supports itself. It is impossible to take account of all these factors in analysing today's employment patterns, let alone in making forecasts. However, in looking toward the end of the 20th century, our perspective must include (1) some appreciation of the effects of technology; (2) the changing demographic and social patterns in advanced economies; and (3) the consequences of—and possible future course of—government activity.

Industrial Composition in 1985

There has been a long-term rise in the relative share of total employment engaged in producing intangible goods or "services." Prior to 1967, the employment shift to services was accompanied by a relative decline in agriculture. Since 1967, the shift has been accomodated by a relative decline in manufacturing. Employment is highly volatile in manufacturing and construction, falling sharply in recessions and then recovering. During the 1981-1982 recession, the steepest since the depression of the 1930's, there was a reduction of nearly 3 million jobs—most of them in manufacturing, construction and mining. The service-producing sector faltered somewhat from its growth trend, but did not shrink.

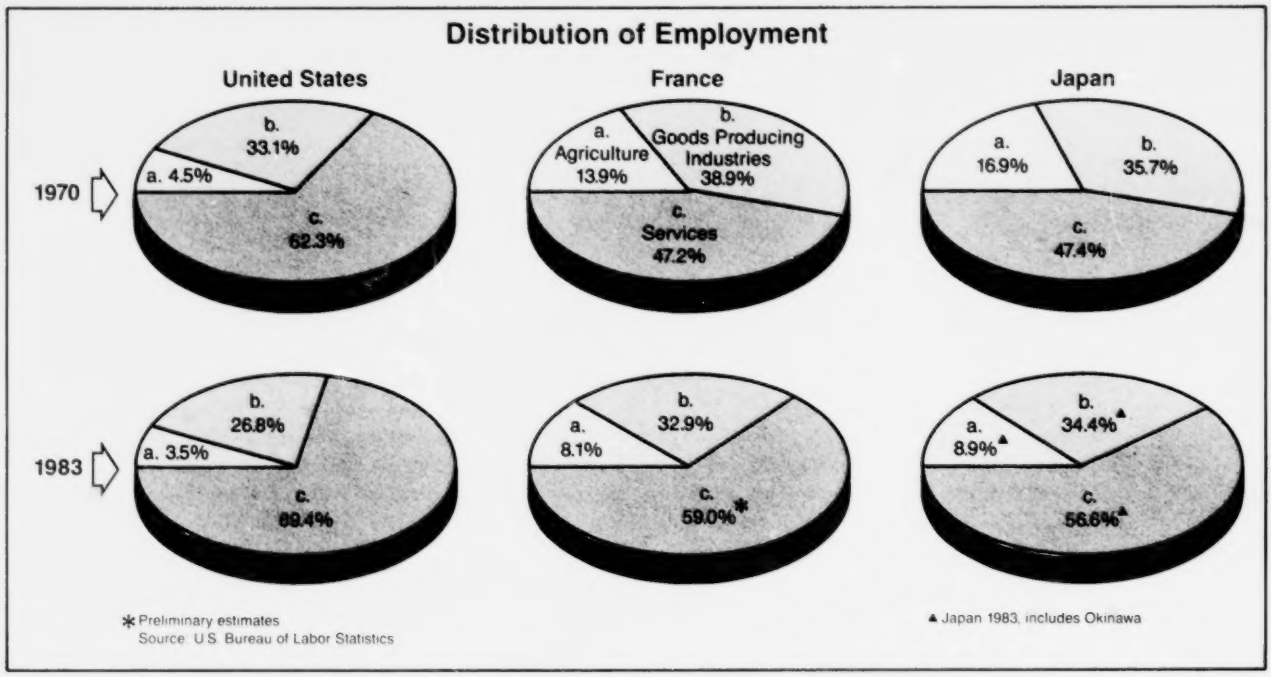
An increased share of employment in services has been associated with very advanced economic development by many economists. It appears that technologically advanced economies are now growing chiefly in the service sectors, as Chart 1 shows for three countries.

The manufacturing sector is not monolithic, however. Beneath the summary data that show the same level of employment in the recent decade and a half, there has been considerable change. Steelmaking, clothing manufacture, footwear, textile employment have shrunk considerably. They may continue to shrink in the decade ahead. In the case of textiles, the shrinkage is partly due to gradual installation of advanced equipment, but—more importantly—to the importation of this labor intensive product from lower-cost producers. In the case of steel, employment decline is due to a number of causes, among them: overcapacity, growing substitution of alternative materials for steel, changing technology, and lower-cost competition from abroad.

On the other hand, employment has grown in some manufacturing industries. The nonelectrical machinery industry and electrical and electronics industry increased their post-recession employment to about 4.3 million in mid-1985. Both of these capital goods industries are expected to continue growing for the next decade, according to the United States Bureau of Labor Statistics.[1] This projection is based on continued defense buildup, and growing business investment in new equipment. However, a protracted recession could undermine

[1]Personick, Valerie A., "A Second Look at Industry Output and Employment Trends through 1995," *Monthly Labor Review*, November 1985, p. 34. The Bureau of Labor Statistics issued new projections one month after The Conference Board paper was given. To the extent possible, the text has been harmonized with new BLS projections.

Chart 1.



the projected growth. Another cautionary note is the rapid growth in capital goods imports, substituting for United States-made machinery.

Agriculture. In the 20th century, this part of our economy has undergone the most thoroughgoing and constant technological change, productivity advances, structural change, and worker "displacement" of any sector. At the turn of the century, some 38 percent of United States workers were in agriculture; now, it is about 3 percent. Yet our farm production has soared. In fact, United States food production, especially grain, is our strength in exports. The United States is the world's largest exporter of agricultural products, selling some $38 billion in world markets—about twice as much as the nearest competitor, France.[2] Toward the end of this century, biotechnology will have major effects on agriculture and on chemical industries linked with it. (See below, p. 10.)

Mining was the technologically transformed industry of the 1950's, and the shrinking industry of the 1960's. Then, in the 1970's, it grew rapidly in employment, due primarily to increased oil prices and increased world prices for other mineral resources. This industry has undergone waves of technological and structural change, and employment shifts that have attracted relatively little notice. Today, it employs about a million workers, about 60 percent of them in oil and gas fields. In the next decade, there may be little or no employment increase in mining.

Service-producing industries—employing nearly three quarters of the United States work force—are growing, and will continue to expand their share of job growth in the future. Within this broad grouping of industries, however, there is a wide diversity of service "product," and different growth expectations.

Transportation and public utilities, including communications, employing about 5 percent of the United States work force, is growing very slowly. Withdrawal of government regulation in transportation (trucking, airlines, railroads) began at the end of the 1970's. The breakup of the communications monopoly, and deregulation of that industry, occurred in the early 1980's. The competition thus fostered has created some additional jobs, extinguished others—with a small net gain. However, the employment security formerly enjoyed in these industries has vanished. Union power to impose high, nationwide wage standards has also been forfeited to a competitive, market determination.

Finance. Banking, insurance and real estate services have increased steadily, and have raised their share of total employment to over 5 percent. (See Table 1.) Major technological change, in the use of computers and communications, has increased the productivity of financial services manyfold. Yet demand for more and new services continues to increase employment. Part of the reason is that computers, which have cut deeply into clerical "back room" work, also have expanded the variety of services the industry can offer. As a result, more customer-contact workers are needed. This kind of shift, due to automation of a "production" process, is discussed further on page 13.

Trade. Employment in retail and wholesale trade, including restaurants, has been growing rapidly. Retail trade is also the largest employer of part-time workers. Much of the growth during the 1970's was due to expansion in the restaurant and "fast-food" industry. There was a readily available supply of young workers to staff the industry's growth in that decade. An even more important growth factor may be the decline in

[2]Culen, Eva, "International Dimensions of the Farm Business," *Economic Road Map* No. 1995-1996, The Conference Board, 1985

Table 1. Distribution of Employment in the United States

(in millions)	1984	1984 percent distribution	1980	1980 percent distribution	1970	1970 percent distribution	1960	1960 percent distribution
Total working for pay[1]	106,746		102,076		81,184		66,910	
Goods-producing:								
agriculture[2] and [4]	3,108	2.9	3,067	3.0	2,964	3.6	4,557	6.8
mining	998	.9	1,027	1.0	623	.8	712	1.1
construction	4,316	4.0	4,346	4.3	3,588	4.4	2,926	4.4
manufacturing	19,590	18.4	20,285	19.9	19,367	23.9	16,796	25.1
Service-producing:								
transportation and public utilities	5,170	4.8	5,146	5.0	4,515	5.6	4,004	6.0
trade (wholesale and retail)	21,787	20.4	20,310	19.9	15,041	18.5	11,391	17.0
finance, insurance, real estate	5,665	5.3	5,160	5.1	3,645	4.5	2,629	3.9
services	20,662	19.4	17,890	17.5	11,548	14.2	7,378	11.0
government	15,968	15.0	16,241	15.9	12,554	15.5	8,353	12.5
military (in U. S.)[3]	1,697	1.6	1,604	1.6	2,118	2.6	1,861	2.8
Self-employed[4]	7,785	7.3	7,000	6.9	5,221	6.4	6,303	9.4

[1]Sum of items below.
[2]Includes self-employed in agriculture.
[3]From Department of Defense.
[4]From Current Population Survey.

eating at home that accompanies the greater involvement of women in the work force.

Growth in retailing, restaurants and "fast-food" outlets is sometimes decried by social commentators as evidence of decay. Others note that the work is low-paid and insecure. But as goods move from fabrication into distribution channels, and finally reach the point of consumption, they require more labor input. From the growing of wheat, to transporting, milling, packaging and distributing it, many advances have conserved labor: technology and management systems increased output without increasing employment. But making flour into a croissant and delivering and serving it in The Conference Board's snack bar is highly labor-intensive and resistant to mechanization.

Services. The largest increases in employment have been in this industry—but only in some sectors. *Personal services,* such as laundries, barber and beauty shops, seem stabilized at about a million employees. *Health services* grew very rapidly in the 1970's, and have reached a total of over 6 million employees. Cost-cutting efforts are affecting this industry's growth, and will continue to constrain and moderate the growth that might "naturally" have occurred as the United States population's average age increases. But employment will continue to rise in the non-hospital health care sector.

Business services is now the most rapidly growing sector. Some elements of this group include agencies that supply temporary workers, public-relations, consulting, computer-service, building-management, and protective services. Growth of business services is directly related to the general prosperity of other private-sector businesses. However, there seems to be an additional factor creating extraordinary growth in the 1980's. This is a marked increase in incentives for contracting out, to business-service firms, work that might have been done "in-house."

Government employment has been relatively stable since the 1970's at 15-16 percent of total employment. It is expected to increase very slowly in the future, not quite maintaining that share for the next decade. Most of the 8½ million employed in education are local and state government workers. Due to the rising number of births in the 1980's, education employment will begin to grow, moderately, in the next decade.

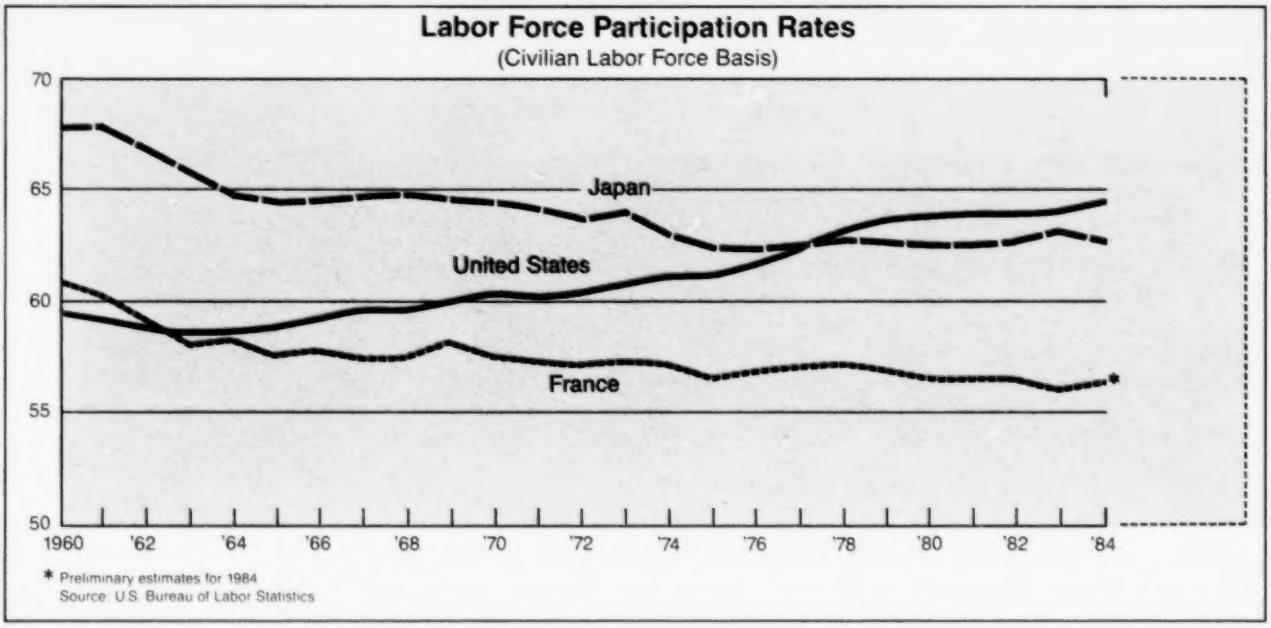
* * *

The share of total employment in service-producing industries will probably increase further by the end of the century. Productivity increases in manufacturing will allow a rising level of output with about the same number of workers. Thus, the relative share of total employment in manufacturing will continue to decline from its current 18 percent to perhaps 15 percent by the end of the century.

Demographic "Revolutions"

The most dramatic change in the United States employment market has been a major increase in women's participation. Less than 40 percent of women were in the labor force in 1960; now their participation rate is just under 55 percent. The largest increase was among 25 to 54-year olds, who now have participation rates of over 70 percent. This growth is more pronounced than in other countries, although increased par-

Chart 2.



ticipation by women is occurring in other industrialized countries as well.

The increased participation of women reflects a major social change and, in turn, is contributing to further changes. It used to be typical for women to work for a time before marriage and child-bearing. Then, most women workers withdrew from employment, perhaps returning after the children were well into school years. This pattern had negative effects for women's pay and reduced the possibilities of careers; it diminished the returns to women's investment in education. The social shift of the 1970's was an increase in the *continuity* of women's participation in the labor market.

Most women work in the service-producing sector. Some of the employment opportunities created in this sector have occurred because tasks formerly carried on in the home are now done in the market. And, as more women work, more of these services must be purchased. Thus employment is increasing in restaurant, child-care, nursing and convalescent care, social work, and counseling services.

Primarily because of the increased involvement of women, the extent to which the population as a whole participates in the work force has been rising since 1964. Just under 65 percent of the adult population is now in the United States labor force—a somewhat higher rate than in France or Japan (Chart 2).

During the decade of the 1970's, the post-World War II "baby boom" generation began to enter the work force. The major increase in young adults coincided with increased participation of women to produce very rapid rates of labor force growth all during the decade. Large increases in the supply of labor diminished the incentive to conserve labor, that is, to increase labor's productivity. Much of the "new" supply (young entrants, adult women reentering the labor force) was absorbed in services such as retailing, restaurants and personal services. These are labor-intensive industries: Output grew, but productivity did not. Consequently, the large increase in labor supply was absorbed.

Family Structure

Families and households have been growing smaller throughout this century. In recent decades, there has been a major increase in individuals living alone.

With rising rates of divorce, there is also increased likelihood that children will live for a time with only one parent, usually the mother. Of the 62 million families in the United States in the first quarter of 1985, 10 million were maintained by women—5.5 million of whom were employed. Married-couple families are likely to have both husband and wife employed. Of the 42 million families in the third quarter of 1985 that had some member employed, 28 percent were supported by husband only; the great majority were supported jointly or by women alone.[1]

Unless there is another (now unforeseen) change in lifestyles, these trends will probably continue: Most wives will continue to work, whether or not they have children. Most working wives will have only one or two children. Many young children will experience a parents' divorce, and will live with their mother. Remarriage and formation of another family are likely. Continuity of support will probably continue to fall upon the mother. The expectation that they will be the family's support, along with consciousness of rising divorce rates, has itself contributed to the increased participation of young women in the labor force.

The effect of this pattern is not always appreciated in labor-force analysis. One set of data may clarify the point. In the

[1] *Employment & Earnings*, U.S. Bureau of Labor Statistics, October 1985, table A-71.

second quarter of 1985, there were 31 million families with children under eighteen years old. Twenty percent of those families were maintained by women, and nearly seven out of ten of the women were working or looking for work. The data are cross-sectional, reflecting only one point in time. Therefore, they only suggest the magnitude of the chance that a mother will be sole support of her children at some time.

Dependency

The high birthrates from 1947 to the early 1960's have produced a very large labor force to support the nonworking dependents in the population. As noted, the "revolution" that changed women from nonworking dependents into supporters has augmented the depth of producers per dependent in the present-day economy.

From now until the end of the century, the economic dependency ratio for children under age 16 is expected to remain about the same or decline slightly, because births will remain static (even though the "baby boom" women are now at a childbearing peak). However, the economic dependency of the elderly will increase gradually in the 1990's, and more rapidly after the turn of the century. Current trends toward earlier retirement will exacerbate that growth in dependency—if they continue as the group reaching its late 50's begins to grow substantially at the beginning of the twenty-first century.

The age composition of dependency is depicted for France and for the United States in Table 2. While France had 1.3 dependents per worker in its economy, the United States had less than 1.1 Our dependency was composed more of the young (46 percent of the dependency) than was French dependency (41 percent).

There are at least two reasons for the higher dependency rates in France. One is a lower labor force participation rate (comprised of a major decline in male labor force participation, and only a moderate increase in female participation). A second major cause is entitlement to retirement pay: pensionable age in France is 60; in the United States generally, 65.

Table 2. Ratio of Economically Inactive to Labor Force Participants, 1982

	France	*United States*
Total population	1.308	1.065
under age 16	.539	.489
age 16-64	.469	.360
age 65 and over	.300	.216

Source: Fullerton, Howard N. and John Tschetter, "The 1995 Labor Force: a Second Look," Monthly Labor Review, November 1983, p. 7, for the United States, and Bureau of Labor Statistics estimates for France provided to the author.

Focusing only on the elderly, it is clear that social decisions about retirement were made in an era when fewer people survived into very old age, and the economic burden appeared much lighter. Given "normal," socially accepted patterns and life expectancy in the United States today, less than half a lifetime is spent in employment. Until the twentieth century, there were very few people who experienced any "life after work." Children began to work much earlier and, once they began, they worked until they died. What dependency the society had to support was only its very young children.

In the short span of a century, life expectancy just about doubled in industrialized nations. At the same time, advanced economies created systems that culminated in a "worklife" of only half of that expanded life expectancy. It is likely that the problems caused by this revolutionary change will be the most serious social and economic stresses that we will face at the turn of the next century.

Productivity and Technology

Productivity improvement in the United States economy stagnated in the 1970's, rising at a rate of only .6 percent a year from 1973 through 1979 (compared to previous rates of about 2½ percent). Much research has been focused on the causes of this poor record, among them:

- sudden and severe energy price increases
- reduction in the growth of capital intensity
- decline in research and development investment
- surge of labor force growth
- increases in government regulation.

The energy shocks of the 1970's distorted economies, causing rapid inflation and a volatile economic and policy environment for business.[4] The labor force growth rate and employment surged 2½ percent a year, making labor *relatively* less expensive than capital, diminishing the incentive to conserve labor. During the 1970's, also, government regulation was extended to the areas of environmental protection and employee-health protection. Some capital investment that might have gone into more efficient production was instead directed toward reducing toxic emissions into the air and water, reducing the "dirtiness" of production facilities for the people working in them, and reengineering the product itself, in some cases, to make it safer for users. The many analyses have been inconclusive about the exact role that these factors played in the productivity slowdown of the 1970's.

The 1980's began with two recessions. Now, ten quarters into recovery, business productivity growth has averaged 2.2 percent at an annual rate. But productivity always surges in recoveries. In the five post-World War II recoveries that lasted as long as the current one, business productivity growth rates ranged from 3 to 5.1 percent.

[4]See, for example, Ezra Solomon (ed.) *International Patterns of Inflation: A Study in Contrasts*, Report No. 853, The Conference Board 1984, Chapter 2.

Table 3. Average Annual Growth in Manufacturing Productivity, and Related Measures, Ten Quarters after the Trough of Postwar Recessions

(percent change at compound annual rate)

Recession trough quarter	*Productivity*	*Output*	*Hours*	*Employment*	*Hourly Compensation*	*Unit Labor Cost*
1949 IV	3.8	11.1	6.9	6.0	8.4	4.4
1954 II	2.2	5.5	3.2	2.4	5.5	3.2
1958 II[a]	3.4	8.5	4.9	3.9	4.2	.8
1961 I	6.3	9.6	3.1	2.1	3.2	-2.9
1970 IV	5.9	10.2	4.1	3.1	6.2	.3
1975 I	4.1	8.3	4.0	2.9	8.2	3.9
1980 III[a]	4.2	6.6	2.3	2.0	8.4	4.0
average cycle	*4.5*	*9.0*	*4.3*	*3.3*	*6.3*	*1.8*
1982 IV	3.8	8.1	4.1	3.1	3.7	-.1

[a] percent change, trough to peak (recoveries were less than 10 quarters in duration)

Source: Fulco, Lawrence J., "The Decline in Productivity During the First Half of 1985," *Monthly Labor Review*, December, 1985, p. 39.

Output gains are almost identical to those of past recoveries, but employment has risen much more than in the past. This development has a 1970's ring: Employment surges, productivity does not. Moreover, most of the growth of employment has been in the service sector. Manufacturing has recovered only 60 percent of the jobs lost in the last recession. From Table 3, it is clear that manufacturing employment and work-hours growth have been below average for recent recoveries, but even so, productivity increase has been relatively low. Only the recovery begun after the 1954 recession was as weak as the current recovery for manufacturing.

The increasing shift to services was not cited in the list of possible culprits causing a slowdown in productivity, because some services have higher rates of productivity growth: for example, communications, electric utilities, food retailing, banking. Other services, such as restaurants and beauty parlors, do not. The shift in what society consumes may make some contribution to the productivity slowdown. It is consuming less goods, more paid personal and group interaction. As goods-production is mechanized, labor moves into the distribution of goods. Next, it moves closer to the point of interaction with final customers. Productivity advances push labor intensity further and further toward personal interaction points. The implications of this movement for turn-of-the-century employment are discussed on page 13.

A projection of productivity trends for the next 15 years is particularly risky. We do not know why the productivity advance of the recent decade was so weak, so we cannot evaluate whether the causes of that poor record are still present, increasing or diminishing. This uncertainty calls into question whether the causes of economic growth can be identified and their power quantified so close to the events. Those who are required to use some productivity "assumptions" in projecting United States economic activity and employment are using a range of estimates. But, significantly, that range is well below the historical trend (before the 1970's) of 2 to 3 percent a year. Loosely, the expected range of productivity growth is now from about 1 to 2 percent, for the decade 1985-1995.[5] Beyond that, estimates are not made.

Technological Advance

The United States historically has prized invention, and felt secure in its technological leadership of the world. Recently, that edge has been fading in one sector after another. There is general agreement that this country excels at basic science of the "revolutionary" kind, such as lasers and recombinant DNA technique. Japan excels at the applied sciences, and especially in the development of new processes and commercialization of new knowledge.[6] This suggests that some of the

[5] Personick, Valerie A. "A Second Look at Industry Output and Employment Trends through 1995," *Monthly Labor Review*, November, 1985, p. 34.

[6] Reflected recently at a "Symposium on Economics and Technology" in March 1985, sponsored by the National Academy of Engineering, the Center for Economic Policy Research, and the Departments of Chemistry and Chemical Engineering at Stanford University.

technologies discussed below may have an earlier impact in Japan than in the United States.

Robots have received the most popular attention—and indeed the vision of a factory with no workers is dramatic. However, adoption rates for robots have been slow, and the process of integrating them into a fully automatic, computer-controlled process is moving even more slowly. In a March, 1985 study (prepared by the Congressional Research Service for a subcommittee of the House Committee on Energy and Commerce), the following evaluation was made:

> "Firms will have to raise large amounts of capital to replace even relatively small numbers of the labor force with robots. Capital cost constraints could be expected to hold blue-collar automation at well under the 75 percent level that has been cited by some as technologically possible. Even if the price of robots should experience dramatic declines, capital constraints could be expected to restrain the relative growth of robots...
>
> "The cost to automate only 5 percent of the U.S. blue-collar labor force with robots could be greater than $45 billion. Thus, under the (rapid adoption) scenario produced by the Leontief-Duchin study, the United States will be making significant increases in the size of its robot investments in the remaining part of this century. But even this sizable investment might not be large enough to automate and replace 5 percent of the U.S. blue-collar labor force."[7]

Another study, done by the Society of Manufacturing Engineers and the University of Michigan, projects that about 4 percent of the work force will be displaced by 1995. By industry, displacement rates will be: 15 percent for electronics, 10 percent in primary metals, 10 percent in consumer nondurables, and 10 percent in aerospace.[8]

The Commerce Department's 1985 Industrial Outlook estimates that United States output of robots will grow to about 10,700 in 1989. That projection was based on an estimate of 3,500 units in 1984; but the Commerce Department now reports that United States-produced robots totaled 5,535 in 1984. However, an increasing share of the robotics market is going to Japanese and some European producers. It is possible that introduction of such factory automation is moving much more rapidly now, and in the near future, than is known.

Computer-aided design and manufacturing figures given by the Commerce Department show a rapid rise. Estimated "number of systems installed" were 12,000 in 1983, and are expected to rise to 63,000 annually by 1988.[9] The combination of computer-control and robots, difficult to define in the abstract, is the heart of a workerless factory. It appears that the rate of transformation to such a production system will be very slow, at least until the mid-1990's.

Five types of technologies can be combined under the general term "programmable automation":

- robots
- computer-aided design
- computer-integrated manufacturing
- numerically controlled machine tools
- flexible manufacturing systems

Many companies introduce these technologies in piecemeal fashion, applying them to one major segment of manufacturing process at a time. However, the recent trend has been toward full-scale engineering of totally integrated, computerized systems, manufacturing products redesigned to the automated production process. Such a system would operate without production workers, with a few technicians to monitor its functioning. A report by the United States Congress' Office of Technology Assessment concludes that such facilities are "only a remote possibility" for the next 10-15 years. (However, the present author has seen just such a factory, run by Fanuc Ltd. in Japan.) The Office of Technology Assessment report evaluates employment impact as follows:

- Demand for engineers and computer specialists will increase.
- Numbers of production workers will decline. Drafters will "face diminishing opportunities." Clerical workforces will also shrink.
- Demand for upper-level managers and technical sales and service personnel will rise, although lower- and middle-management opportunities may fall.

"...These effects suggest major shifts in the occupational mix of manufacturing industries, especially metal-working. Overall, the salaried or white-collar work force will constitute a larger proportion of manufacturing employment, although it is not clear how much their ranks will grow in absolute terms. Programmable automation producers especially are likely to employ relatively few production personnel; their situation may signal future patterns among other firms and industries. Consequently, there will be few opportunities for people displaced from other manufacturing industries to move into jobs among producers of automated equipment and systems...

"In many ways, the shifts in occupations will not be straightforward. Some skills may only be required temporarily, after technology has been introduced but before further automation is achieved. For example, when automated equipment is used in isolated applications, there may be many needs for programming. But the integration of design with process planning and production systems reduces the need for programming, as does the development of standard, easy-to-use software packages. These 'short-term' phenomena may persist for many years, making it hard to plan for long-term employment change."[10]

New materials may have the biggest employment effect when they are substituted for an existing material. For example, as *composites* (fiber-reinforced plastics) begin to be used for aircraft "skins," they capture a substantial part of aluminum's

[7] *The Computer Revolution and the U.S. Labor Force*, Committee Print No. 99-G, March 1985, published by the Subcommittee on Oversight & Investigations, p. 28

[8] Daily Labor Report, Bureau of National Affairs, Inc., Aug. 30, 1985, pp.A-1-A-2

[9] In *1985 U.S. Industrial Outlook*, p. 21-7

[10] *Computerized Manufacturing Automation: Employment, Education, and the Workplace*, Washington, D.C., U.S. Congress, Office of Technology Assessment, OTA-CIT-235, April 1984, p. 7.

market; when used for ships, *composites* reduce the need for steel.[11] As *advanced ceramics* are developed for use in cutting tools, ball and roller bearings, and engine parts, they reduce demand for specialty steels. Ceramic engines will probably be built before the 1990's, further diminishing steel's prospects for regeneration.

Genetic engineering is being applied to produce new pharmaceutical products for diagnosis, immunization, and treatment. One of the potentially most revolutionary uses of genetic engineering, however, is in the production of foods. In the next few years, bacteria that have been genetically modified may produce amino acids and vitamins for animal feed supplements, animal growth hormones, and vaccines. A single gene that confers resistance to herbicides may be transferred to plants that then need no cultivating (because weed growth is suppressed with herbicide).

The genetic engineering of plant traits seems farther off—in the 21st century. Developing cereal plants to make their own nitrogen fertilizer may not be accomplished directly, because of the complexity of structure of the 17 genes that govern nitrogen-fixing process in bacteria. *Science* magazine says, "Even less is known about the genetic basis of other desired traits, including resistance to drought, heat, cold, salty soils, and other plant stresses. Researchers will have to identify the appropriate genes and determine how they work and are controlled... Culture techniques to select cells with the desired characteristics may succeed first, although the culture methods require that whole plants be regenerated from single cells."[12]

The effects of changing technology in food production will probably not be felt until the next century, but they are expected to be profound. The ability to produce nutrition with poorer soil, less rainfall, a shorter growing season, extremes of heat and cold will have effects of a geopolitical nature, not simply effects on industries such as chemicals, fertilizer, and so on. In the longer term, there will be consequences for population growth, the distribution of population over the globe, and the value of land. However far-fetched this may seem, a beginning has been made.

[11] *Purchasing* Magazine, September 12, 1985, p. 2.

[12] *Science*, volume 216, June 18, 1982, p. 1306

The Operation of the Employment Market

The functioning of the labor market is a major influence on levels of employment, unemployment and unmet employer needs for workers. Labor market "signals" and transactions set wage levels, allocate employment geographically and by industry and occupation, and (theoretically, at least) insure that the skills of the workforce are used in ways that produce maximum value.

Government Policy

Private investments by parents, and by individuals on their own behalf, comprise much of the total human-resource development activity of a nation. However, development of the population into productive citizens is appropriately a matter of public policy, as well. Edward F. Denison's studies of the sources of productivity growth in the United States economy 1929-1982 found that the quality of the labor force was a major contributor to national economic growth.[13]

Investment In Human Resources

Long before the contribution of human resource quality was quantified by Denison, however, American thinking linked education with progress. Public policy and general education have been closely intertwined throughout our history, and federal policy began to emerge more than a century ago. However, the link between government policy and job skills training has been uncertain, sporadic and politicized since the 1960's.

During the early 1960's, there was an "automation scare": concern that unemployment might follow from growing mechanization. This combined with Kennedy activism to create new federal policy: to subsidize local "programs" that taught job skills and employment behavior (such as punctuality), and also remedial literacy and mathematics. In many situations the programs were intended for people whose needs were great: the chronically unemployed, those who were in the secondary labor market. These were eventually called "antipoverty" programs. Since development of the programs was local (though funding was mostly federal), there was opportunity to create a great variety of human resource investments, or improvements, depending on the needs of local populations. For example, there were programs tailored to young, rural poor; to laid-off foundry workers; to partially-employed miners in Appalachia; to engineers in a plant that lost a defense contract. There were supplementary educational enrichment programs for 4- and 5-year old children; and house-repair training programs that practiced on homes owned by the elderly.

The programs were changed, subtly but permanently, by the race riots involving young blacks in a number of places across the United States in 1967 and 1968. In the late 1960's, also, there was a growing dissatisfaction with United States involvement in the Vietnam War; young people were numerous (the baby boom had reached its late teens) and they were rebellious. In the ensuing national climate of unrest, what was available to be used where suppression was unthinkable? The human-resource programs, the antipoverty programs. Quickly redirected, these human-investment activities became pacification programs, directed toward black unrest and youth unrest. More of the funding was used for "stipends," less and

[13] Denison, Edward F., *Trends in American Economic Growth, 1929-1982*, The Brookings Institution, Washington, 1985, p.30

less for job training. This transformation of purpose soon robbed the programs of their legitimacy, and began, by the early 1970's, to raise public cynicism about federal efforts.

In the early 1970's, decentralization became a favored policy. Now the Federal Government was to allocate funds to *state* and *town* governments, and these would administer their use. Inevitably, the real purpose was transformed again, and the programs became mere conduits for political patronage. Levels of public scorn rose further, and the effort was moribund by the mid-1970's.

Now, a decade later, there is only a small government effort for very low-cost training, directed by private businessmen and some local officials.[14] Its focus is on economic development: providing very limited subsidies for job training to the businesses themselves, in the main. There was also, until recently, a program aimed specifically at workers who have lost jobs due to competition from imports. It provided extended unemployment benefits. As there is no national system of retraining and relocation, the program's retraining-relocation options were essentially unavailable, a dead letter in the law.

Government Intervention in Labor-market Operations

Government policy in most countries is involved in labor market operations and transactions, often designed to overcome market deficiencies. A United States example of this is government-run listings of job openings that are made freely available to job-seekers. This cuts the cost of employment search for individuals and makes more applicants available, sooner, to employers. Thus it reduces total unemployment by cutting the duration of job-seeking efforts. It may also optimize the "fit" of workers to employer needs, by enlarging the choices available to each.

Sometimes, policies inadvertently reduce the efficiency of the market, or even reduce employment opportunities. An example of the latter is minimum-wage regulation. Its purpose is to uphold employment "standards" by preventing employers from taking advantage of an oversupply of labor. However, minimum-wage laws also keep employers from creating jobs paying less than the prevailing minimum, although there may be work of lower value to be done—and there may be people who would be willing to do it. Minimum-wage regulation prevents such a transaction from taking place.

From time to time, other government program interventions attempt to counteract the effect of a negative policy. For example, there have been sporadic employment programs that provide subsidies (or tax deductions) to employers for payroll costs. These allow the employer to pay the minimum wage by supplying part of that cost with government funds. When subsidized wages thus overcome a minimum-wage regulation that diminishes employment opportunities, more jobs will be created. If the subsidies are made available only if a particular kind of worker is hired (say, a younger person), that worker carries an advantage in the labor market. This advantage could operate at any wage level, if it is not restricted. For example, workers determined by a government agency to have been laid off because of foreign competition can carry vouchers that give them an employment advantage over other applicants.

These illustrations of governmental intervention in labor-market operations are not intended to suggest that the *level* of regulation is increasing in the United States. Instances of withdrawal of regulation can also be cited. For example, numerous state and local actions of two types have generated more employment:

- repeal of local ordinances and/or state laws mandating business closure on Sundays, or other hours regulation
- liberalization of occupational licensing and certification.

Probably tens of thousands of retailing jobs in supermarkets, appliance stores, and department stores have been created by the repeal of Sunday-closing laws. When a barber's license is no longer required, and the bureaucratic limits on total licenses issued are thus eliminated, more low-cost hair-cutting shops open, and employment increases.

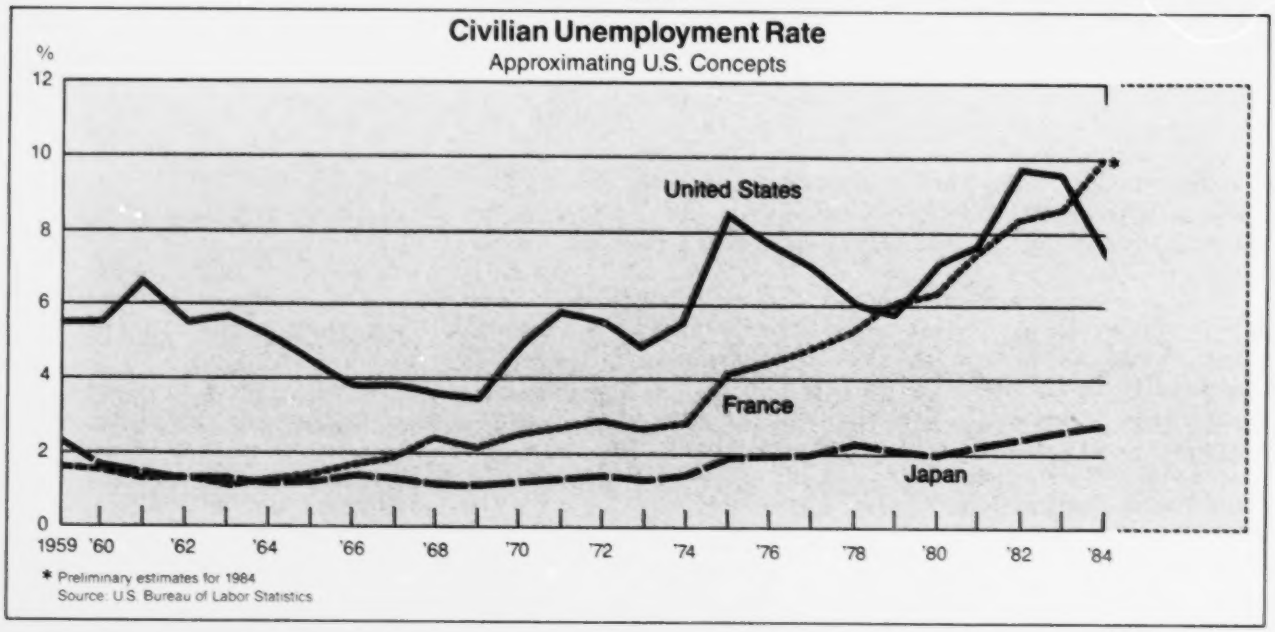
Government intervention includes income redistribution, modifying some of the harsh effects of unemployment. People who have lost their jobs are (for the most part) entitled to partial income support for a short period of time, usually six months. The limitations on amount and duration of payments are intended to deter dependency—at least they do not create incentives for prolonged idleness. The individual who has not become reemployed in the first six months after job loss, and falls into poverty, then may enter the public- welfare system at very low levels of support. (However, the "able-bodied" sometimes do not qualify for welfare.)

There is a great deal of variation among state programs. As a generalization, the system does not provide retraining or relocation, or extend payments for these constructive approaches to unemployment. Unemployment compensation was designed for temporary and minimal income support, and that is all it does. In a few states, some retraining "programs" are linked with unemployment benefits. It is uncertain whether the government's flickering commitment to employment training will grow again and respond to the double challenge of higher joblessness and higher skills requirements.

One barrier to training programs is particularly serious. To be efficient and cost-effective, the argument goes, training should be specifically focused on jobs that are in high demand. Preferably, training should only be offered for a job that employers cannot fill. Training funds and resources are not efficiently used when they are expended on non-existent job vacancies. This requires more foresight and flexibility than governmental agencies can develop. Nor can employers foretell what their most pressing job-skill needs will be. As if this basic problem were not a sufficient barrier to national training programs, there is another: This is the drive, always present in public efforts, not to subsidize privileges for one group at the expense of all. So, training programs must just provide an extra skill at the margin. Under this kind of philosophical constraint, the Reagan Administration's "Job Training Partnership Act" is currently offering in some places, under private business leadership, job training costing a few hundred dollars. The constraints of efficiency (linkage to immediate

[14]Berenbeim, Ronald, *Company Programs to Ease the Impact of Shutdowns*, Report 878, The Conference Board, 1986

Chart 3.



job placement) and low per-capita expenditures combine to limit the program's applicability to people who barely need it anyway. In this sense, the training program operates "at the margin." This characteristic hinders its usefulness either as a system for massive national adjustment to new technology, or national response to endemic long-term unemployment.

Trends in Unemployment Experience

Over the past sixteen years, the United States has experienced four business cycles with the attendant rising, then falling, unemployment levels. However, it appears that our lowest level of unemployment, at the recoveries' peaks, has been increasing. (See Chart 3.) When unemployment due to recession was completely overcome, it reached a low point of 3.5 percent in 1969. Then a recession, and recovery, with unemployment at a low of 4.9 percent in 1973. Another recession, then recovery, and unemployment fell to 5.8 percent. Currently, the low point will probably be about 7 percent for 1985.

To date, the factors contributing to this increase in "structural unemployment" have not been fully identified. One study has found that much of the increase is due to a rise in long-term unemployment:[13] those who have lost jobs do not easily find reemployment. There could be a multitude of causes. If the job- information system is not providing enough information on vacancies, or is not spreading it widely enough for easy use, this could be a contributing cause. In an age of communications technology that is very nearly revolutionary, our employment information system may be weak—an anomaly. Another factor may be the amount of income available from sources other than employment. However, the reduction in this kind of support under the current Administration suggests that nonwork income is a lesser factor, not an increasing one. A related cause of higher unemployment might be increasing amounts of employment in the underground economy—some merely "off the books," some illegal. Yet an individual so engaged seems unlikely to report himself as searching for work. Therefore, even if underground employment is growing, it is not adding to the trend toward rising rates of unemployment in recovery periods.

It is also possible that the amount of basic education and training available is insufficient to fit all of today's work force to the needs of employers. Some large employers, when their needs are great, operate extensive training programs. Usually, these are designed to "upgrade" and retrain their existing work force. But an industry in competitive difficulty, or other decline, does not have funds or the incentive to retrain its workers so they can easily find a job elsewhere.

Compared with European countries, our unemployment seems low. It is also more volatile. Our unemployment rates are far above those in Japan, however. Many analyses have commended the system of lifetime employment that a few of the largest Japanese enterprises offer to their male employees and the general culture of security that makes employment duration in Japan much higher than in the United States. While employment security may be beneficial to morale, it probably accounts for little of the low unemployment levels in Japan. Some part of lesser unemployment there is due to withdrawal from the labor force.[14]

[13]Sider, Hal, "Unemployment Duration and Incidence, 1968-82," *The American Economic Review*, June, 1985, p. 469

[14]The measure of unemployment, by U.S. concepts, is the proportion of people actively searching for work, among those in the labor force. The labor force is the total of those working plus those searching. Thus an unemployed person who *stops* searching has left the labor force. The unemployment rate is lowered by this departure.

Employment Flexibility

Certain kinds of employment are inherently less stable and secure than others. In the next decade, it seems very likely that total hours of work in such jobs will increase as a proportion of total United States employment in recovery years, but be volatile and fall in recessions. Production workers in goods-producing industries have their hours reduced, then are laid off in recessions. In the professional-technical-and-clerical areas, too, there are increases and decreases in the amount of work needed. While companies do not easily "lay off" these workers, they seem more and more to be using a system that allows them to reduce white-collar work in another way.

This is done by relying on "contingent" workers. For example, a company might add clerical workers on a day-to-day or week-to-week basis, hiring them from a temporary help agency. It might obtain technical staff this way, too. In the United States, there are now about 700,000 workers supplied by temporary help agencies. The firm might also contract for engineers or chemists from a technical-employee firm, for periods of months or years. It might have self-employed technical writers working on specific projects, such as instruction manuals or an annual report. The firm might contract its advertising and promotional campaigns out to independent companies or partnerships; it might also hire a public relations service. Payroll and accounting functions can be contracted to a data processing service. And so on. Finally, the firm might hire more part-time staff whose hours can easily be increased or cut, or eliminated entirely.

Most of the employment created by these actions on the part of (for example) an electronics firm will be external to the firm's core payroll. The hours will be recorded mainly in an industry called "business services" and its subindustries such as personnel-supply services. There has been extraordinary growth in the "business services" industry: from 2 to 4.1 million employees between 1974 and 1984. Employment in personnel-supply services more than tripled in that period, rising from 266,000 to 828,000. In 1985, with overall employment growth slowing, these services continue to grow.

The objective is flexibility for employers. United States enterprises are not so regulated, nor so security-ridden, that they cannot expand employment rapidly in recovery. They do just that. The other side of this coin is that, in recession, employment falls the more easily both for blue-and for white-collar workers, especially in contingent-employee relationships.

An Impressionistic Discussion: Where Will Employment be Tomorrow?

The three preceding sections have moved, gradually, from factual descriptions toward inferences. This final section will move into overall impressions of future trends. The underlying facts are given, but the future must be imagined.

Total United States employment in goods-producing industries will probably remain at about the same level as today: 28 million workers. However, overall output in the goods sector will increase. Productivity advances will continue to permit rising output without commensurate increases in the labor force.

Employment will Grow at the Point of Consumption

The United States labor force will continue to grow from now until the end of the century, though at a slower pace than during the 1970's. The increase in total number of people employed will appear entirely in service-producing industries. Productivity improvement will continue in many service-producing industries, particularly because of broader use of computer-communications systems. These are also likely to transform industries, not merely improve their conventional systems of operation. In services such as utilities (electric and gas), communications and transportation, the amount of "blue collar" production work—already quite low—will continue to fall because of technology. The amount of sales, customer service, and other personal-contact work will remain the same or increase.

In a general way, this is what is happening to employment in advanced industrial economies: Productivity increases due to technology—the deepening of capital—have allowed more and more physical output with less and less direct labor. Yet labor requirements continue to increase overall. They are pushed "forward" in the production sequence. Now, they are reaching the point of customer contact, the point of usage of the physical product.

For a simple example: Very little labor is required to produce cotton— growing, harvesting, cleaning, bleaching, spinning and weaving it. In recent decades, we have mechanized the steps of fabricating such a final product as bandages, sterilizing and packaging them—little labor there. Shipping now requires some labor; but better management, technology and sharper competition are cutting those labor hours, too. When that bandage reaches the hospital, labor input begins to grow. It must be stored, ordered and dispensed to the appropriate hospital floor and patient. The application of the bandage, the changing of dressings, is not only highly labor intensive—it requires advanced training to bring this cotton to use on a post-operative patient. Nor is this the end:—The doctor and the nurse are going to instruct the patient how to bandage his own incision for the next week.

The example illustrates the kinds of employment that are directly related to the consumption of things. And increasing amounts of that employment are in so-called "service-producing" industries. Yet they are jobs that have to do with the final (or next-to-last) point in the goods chain: consumption. Transportation and wholesaling are in the next-to-last

step. Marketing and retailing employment are in the last step. So are restaurants, broadcasting and barber shops. If we could create a new industrial taxonomy, this category would be "industries that distribute and aid in the consumption of things." These jobs are only distantly related to goods-producing industries. They will continue to increase in the future.

Employment in Caring for People Will Grow

Apart from consumption activity, there is another general characteristic of advanced economies that creates jobs: We are increasingly a crowded and complex society. At the turn of the last century, the United States was less crowded, more stable, and in many ways its families were far more self-sufficient than today. Looking at the increase in service employment from this angle, one can see the reasons for growth in the "helping professions" and employments: The less stable family is contracting out what was traditionally done at home, and these changes are creating new needs. The growth of these professions is a transfer, to market employment, of functions that were once done on a nonmarket, interpersonal basis in the family and community.

There are thousands of school counselors and "youth advisers" to guide young people—over and above their teachers. There are child psychologists, family-court social workers, housing project "youth directors," remedial reading assistants, recreation organizers, and play-group monitors. Day care is a fast-growing industry. All of this service employment is fairly recent in its development, and is expected to grow even though birth rates and the youth population will not.

Among adults, there is also a trend for work once handled within the family or community to be "professionalized". Employers have alcoholism programs, using counseling professionals on staff, and referring alcoholics to outside psychologists (and facilities). We hire "professionals" to tell us how to dress; to arrange parties; to decorate offices, hotels, and homes; even to develop a social or public image for us. We use vacation planners, wedding arrangers, diet advisers, exercise tutors, debt counselors, and caterers. We depend upon an extensive health care industry and growing preventive and wellness industries.

At the far end of the age progression, care for the elderly occupies a rising number of professional and nonprofessional workers. Even though the dependency level in the United States is low, and will begin to grow only toward the end of this century, the *care* of dependents seems increasingly to be "market" work, and institutionalized work as well. That is, it is work done in institutions or businesses or in market systems (such as visiting nurse agencies), rather than on an individual basis (such as household help). Thus employment in caring-for-people industries will continue to rise.

Protection Work will Continue to Expand

A more crowded, less stable society also requires more workers who protect people and property. Some of these jobs, easy to identify, are in government: police and fire services. There are private guard services, employing over 400,000. More difficult to find in the data are the thousands of jobs that involve public protection in a broader sense. These are people who monitor toxic emissions, public-health authorities, water and sewer inspectors, food and drug inspectors, public authorities who check business practices and equipment from weights-and-measures bureaus to bank monitors and auditors. Parts of the accounting firm industry are in protective work, and the law connected functions including court and prison systems. Air travel security personnel, not identified and counted separately, are also directly involved in protection work. This kind of protective work is increasing in advanced economies, and it occupies hundreds of thousands of technicians and professionals. Although the jobs may be described in such a way as to imply that they fall in the caring-for-others category, their purpose is protection of the public, so we lump them in the group with police, fire and guard services.

Finally, there are millions of jobs that are not purely "protective," but that are developing some protective elements. This cannot be quantified, but can be observed. There is a receptionist in the lobby of a company, a plant, or an apartment building. There is an "appointments desk" in the lobby of an office building, or a newspaper, a foundation. There is an entry person at a college dormitory, and a door watcher in the library, the dining hall. There are more and more of these reception facilities, employing more and more people, whose jobs—more and more—involve what might be called "soft security". They are gatekeepers and recorders of the presence of others in a closed environment—closed for protection from casual entry.

Sustaining Quality in a Crowded Environment: Cleaning It

There is one more category of work that is growing: cleaning up the advanced society. Here is work that is barely noticed, but is increasing nonetheless. The rubbish collectors, streetsweepers, hotel maids, window washers, restroom attendants, building custodians, orderlies, dishwashers, busboys, and cleaning crews of all kinds of facilities, from hospitals to airports to airplanes. In the future, the numbers of people involved in this kind of work will increase, as we expend more of our affluence on maintaining the quality of a crowded public environment.

All three categories of work—caring for others, security, and cleaning—are pure service work, unconnected to goods production. They are really *beyond* the point-of-consumption jobs mentioned at the outset as the "growing end" of material production. They are also impossible to automate (though they may use some advanced technologies, such as video cameras). Many are relatively low-paid; and some employ large proportions of minorities, women and immigrants.

Thinking about the future of employment in a technologically advanced society, we characteristically project requirements for engineers, chemists, technicians. Then we look at the small numbers yielded by such an analysis and ask: "Where will the millions who would ordinarily go into factories, or offices, find employment? Will there be nothing for them to

do? Will we have a nonworking class and just a small number of technicians doing all the work?"

The answer is no. The future of advanced industrial economies is that rising productivity in manufacturing will allow a slow rise in output with the same number of workers as today. Yet production and consumption of services will continue to increase rapidly and to proliferate in variety. More and more employment will focus on maintaining and increasing the quality of life— with more services, and not so much more goods. The rising level of service employment will be in the four general groups described above. These are: (1) work at the point of consumption of goods and services—the personal interaction point; (2) work involving care—health, psychological, custodial, social; (3) protective work; and (4) cleaning. These are the jobs that will accommodate the gradual rise in the labor force between now and the end of the century.